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The TRW Thermal Insulation Process, *C. Steimer,* V. 36, No. 3, p. 37.

AUTHOR INDEX

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Aldridge, D.S., Environmental Engineering Within the Automotive Component Development Process, V. 36, No. 1, p. 19. *Test engineering philosophy and the development of knowledge-based tests for automotive components are discussed. A discussion of the inputs required for knowledge-based tests are provded for the automotive vibration, corrosion, and dust environments.* (DTE: Climatics and Thermal, Test Tailoring; PR: Durability/Fatigue, Reliability Achievement).

Arora, A., Role of Failure-Mechanism Identification in Accelerated Testing, V. 36, No. 4, p. 39. (Abstract—see Hu, J.M.)

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Barker, D., Role of Failure-Mechanism Identification in Accelerated Testing, V. 36, No. 4, p. 39. (Abstract—see Hu, J.M.)

Basu, R.S., Recovery and Recycle of HCFCs by Activated Carbon Adsorption, V. 36, No. 2, p. 33. (Abstract—see Logdson, P.B.)

Bâzu, Marius, Reliability Testing of Semiconductor Devices in a Humid Environment, V. 36, No. 2, p. 37. *The influence of humidity on semiconductor device reliability is investigated to emphasize its role in the failure process as a stress factor and to model the reliability-humidity relationship. Experiments were performed on two types of plastic encapsulated semiconductor devices (optoelectronic and ICs). Reliability data obtained from functioning at humidity and temperature are compared with those obtained from functioning at the same temperature but at a lower humidity level. The experimental data are also used to validate an original model. The model allows the design of accelerated tests with humidity as one of the stress factors. The model is compared with previous models.* (DTE: Climatics and Thermal, Test Time Compression; PR: Durability/Fatigue, Reliability Achievement)

Berro, N., Investigation of Humidification Plant Additives as a Source of Contamination on Semiconductor Wafers, V. 36, No. 6, p. *15. This paper discusses humidification plant additives as a source of contamination on semiconductor wafers. Contamination was observed on wafers being processed in a Class 100 semiconductor facility during extremely cold weather. An analysis suggested that a reaction between additives in the humidifiction plant had formed a volatile product. A mechanism for the formation and transport of this compound is proposed. Bcause of the chemical affinity of the contaminant for gold surfaces, a simple method for monitoring proved useful. Gold-coated, AT-cut quartz crystal monitors were placed in the contaminated airstream and maintained at 10°C. The rate of change of resonant frequency gave an objective, qualitative measure of the concentration of the contaminant in the air. A test for the presence of the compound on surfaces and in aqueous samples was also devised.* (CC: Cleanroom Operation/Procedures; Identification, Measurement, and Monitoring; Sources and Effects; PR: Reliability Achievement)

Brillhart, R.D., Lessons Learned from Modal Testing of Aerospace Structures, V. 36, No. 1, p. 49. (Abstract—see Hunt, D.L.)

Busnaina, A., Three-Dimensional Computer Simulation of Gas Flow and Particle Transport in a Horizontal Diffusion Furnace, V. 36, No. 2, p. 25. *Numerical simulation of gas flow, heat transfer, and particle transport in a horizontal diffusion is presented. The wafers are cooled by inlet cold gas convectively but heated by furnace wall radiatively. Gas velocity between the wafers appears to be small compared with the bulk gas flow. A significant cooling of the first wafer in the batch is observed. Trajectories of aerosol particles in the furnace are predicted by solving the corresponding Lagrangian equation of motion that includes the effects of temperature, drag, lift, gravity, and Brownian motion. Particle transport and deposition on the*

wafers are evaluated using three-dimensional particle trajectories. (CC: Identification, Measurement, and Monitoring)

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Caruso, H., MIL-STD-810E: Significant Changes to Be Implemented with Change Notice 2 (IES Technical Department Reports), V. 36, No. 2, p. 11.

Charles, D., Derivation of Environment Descriptions and Test Severities from Measured Road Transportation Data, V. 36, No. 1, p. 37. *This paper discusses the vibration and shock environments perceived by equipment when it is transported by wheeled vehicles. Methodologies are presented for deriving environment descriptions and test severities from measured road transportation dynamic response data. Measured responses from a data-gathering trial are used to illustrate a number of useful signal-processing techniques and the compilation of environment descriptions that quantify the severity and character of measured data. The environment description is used as the basis for the compilation of a test severity definition in terms of a random vibration spectrum and duration.* (DTE: Shock and Vibration, Test Tailoring)

Cook, J.P., Investigation of Humidification Plant Additives as a Source of Contamination on Semiconductor Wafers, V. 36, No. 6, p. 15. (Abstract—see Berro, N.)

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DasGupta, A., Role of Failure-Mechanism Identification in Accelerated Testing, V. 36, No. 4, p. 39. (Abstract—see Hu, J.M.)

Davis, G.L., Summary of Cassini Acoustic Criteria Development Using Titan IV Flight Data, V. 36, No. 5, p. 19. (Abstract—see Himelblau, H.)

deBlank, R., Contamination Control of Polysilicon Gates in a Vertical Reactor Cluster Tool, V. 36, No. 3, p. 33. (Abstract—see Werkhoven, C.)

DePinto, G., Optimizing Polysilicon Deposition for Film Uniformity and Particles, V. 36, No. 4, p. 31. *A three-step approach to characterize a low-pressure chemical vapor deposition (LPCVD) flat polysilicon process is presented. The first step covers the design and construction of a flat polysilicon deposition furnace for reduced defectivity and improved film uniformity. The second phase characterizes a process for film uniformity and particles using an L_{18} Taguchi experimental design. The third phase verifies the recommended setting from the experimental design by processing confirmation runs.* (CC: Cleanroom Operation/Procedures; Identification, Measurement, and Monitoring; PR: Reliability Achievement)

Donovan, R.P., Application of a Commercial Nonvolatile Residue Monitor to Measure Purity of Solvents and Surface Cleanliness, V. 36, No. 4, p. 28. (Abstract—see Hill, E.A.)

E

Egbert, H., MIL-STD-810E: Significant Changes to Be Implemented with Change Notice 2 (IES Technical Department Reports), V. 36, No. 2, p. 11.

Egbert, H., Proposed MIL-STD-810F (IES Technical Department Reports), V. 36, No. 2, p. 11. (DTE: Criteria and Standards)

Ensor, D.S., Application of a Commercial Nonvolatile Residue Monitor to Measure Purity of Solvents and Surface Cleanliness, V. 36, No. 4, p. 28. (Abstract—see Hill, E.A.)

F

Fields, S., Improvements in Avionics Durability Analyses, V. 36, No. 6, p. 26 (Abstract—see Followell, D.)

Followell, D., Improvements in Avionics Durability Analyses, V. 36, No. 6, p. 26. *This paper includes a description of ELIFE, a software tool developed by McDonnell Aircraft Company, which will predict the fatigue life of solder joints, component leads, and plated through holes. The software can also identify the critical compoents that require analysis. The results of complex finite element analyses of printed circuit assemblies are an integral part of the software, but are transparent to the user. Thus, the time to perform an analysis is reduced, and the probability of committing errors is reduced.* (DTE: Test Time Compression; PR: Durability/Fatigue, Reliability/Achievement)

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Grabowsky, H., (Point of View) The Future of Structural Dynamics and Reliability Testing in the '90s and Beyond, V. 36, No. 2, p. 8.

Granneman, E., Contamination Control of Polysilicon Gates in a Vertical Reactor Cluster Tool, V. 36, No. 3, p. 33. (Abstract—see Werkhoven, C.)

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Heyns, M., Contamination Control of Polysilicon Gates in a Vertical Reactor Cluster Tool, V. 36, No. 3, p. 33. (Abstract—see Werkhoven, C.)

Hibbert, B.E., A Round Robin Exercise on Road Transportation Data, V. 36, No. 4, p. 19. (Abstract—see Richards, D.P.)

Hill, E.A., Application of a Commercial Nonvolatile Residue Monitor to Measure Purity of Solvents and Surface Cleanliness, V. 36, No. 4, p. 28. *This paper describes the use of a nonvolatile residue montior to determine the cleanliness levels of deionized water, pure solvents, and solutions used to measure surface cleanliness by extraction. With the use of calibration curves, it provides a quantitative measure of nonvolatile residue (NVR). Also included is a discussion of how this method can be used to replace other procedures that require the evaporation of large volumes of solvent.*

(CC: Identification, Measurement, and Monitoring)

Himelblau, H., Summary of Cassini Acoustic Criteria Development Using Titan IV Flight Data, V. 36, No. 5, p. 19. *The development of Cassini acoustic criteria using Titan IV flight data is presented. Also discussed are the factors affecting the development of Cassini acoustic criteria using corrected Titan IV flight data including the statistical methods used to account for spatial and flight-to-flight variations, the use of maximax spectra, the data corrections for acoustic pressure increases near the payload fairing surfaces, and the corrections for payload fill factor effects.* (DTE: Acoustics, Criteria and Standards)

Hope, D., Use of a Three-Dimensional Ultrasonic Anemometer to Measure the Performance of Clean Zone and Delivery Systems, V. 36, No. 6, p. *32. This paper includes information on how airflow direction and air turbulence may be determined from the data gathered. This instrument was initially chosen to evaluate the performance of a new cleanroom ceiling system that had integrated the lighting and sprinklers within the filter support grid. The software package used provides immediate on-line results, either in tabular or graphic format.* (CC: Cleanroom Design/Materials; Identification, Measurement, and Monitoring)

Hu, J.M., Role of Failure-Mechanism Identification in Accelerated Testing, V. 36, No. 4, p. 39. *This paper summarizes common failure mechanisms in electronic devices and packages and investigates possible failure mechanism shifting during accelerated testing.* (DTE: Climatics and Thermal, Shock and Vibration, Test Time Compression; PR: Durability/Fatigue, Reliability Achievement)

Hunt, David L., Lessons Learned from Modal Testing of Aerospace Structures, V. 36, No. 1, p. 49. *As a result of new excitation methods and data acquisition hardware and analysis tools, more high-quality data can be collected in less time than was possible in the past. Modal surveys with 200 to 400 channels of response are becoming more commonplace. This paper discusses the many lessons learned about managing the increased amount of data collected and ensuring that the quality remains high.* (DTE: Shock and Vibration)

Hunter, N., Nonlinear Aspects of Shock Response in Isolated Accelerometers, V. 36, No. 2, p. 41. (Abstract—see Paez, T.L.)

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Ingrey, S., Investigation of Humidification Plant Additives as a Source of Contamination on Semiconductor Wafers, V. 36, No. 6, p. 15. (Abstract—see Berro, N.)

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Kern, D.L., Summary of Cassini Acoustic Criteria Development Using Titan IV Flight Data, V. 36, No. 5, p. 19. (Abstract—see Himelblau, H.)

Kuehn, T.H., Particle Contamination Below a Robot Arm in a Cleanroom, V. 36, No. 5, p. 43. *This paper includes experimental velocity and particle concentration data obtained near a circular cylinder robot arm in a chamber that simulates a vertical unidirectional flow Class 10 cleanroom. The airflow field around the robot arm was characterized using a hot wire anemometer. Both mean velocities and turbulence spectral data were obtained. Sodium chloride particles were injected through small holes below the arm to simulate particles generated by moving joints.* (CC: Identification, Measurement, and Monitoring; Modeling and Simulation; Sources and Effects)

L

Lambert, R.G., Fatigue Damage Prediction for Combined Random and Static Mean Stress, V. 36, No. 3, p. 25. *The paper focuses on (but is not limited to) the type of random loading that occurs most often in either a random vibration test or the service environment of high-reliability electrtonic equipment and the correponding support structures for avionic or space application Numerical examples are provided.* (DTE: Shock and Vibration, Test Tailoring; PR: Durability/Fatigue, Reliability Achievement)

Lawless, P.A., Application of a Commercial Nonvolatile Residue Monitor to Measure Purity of Solvents and Surface Cleanliness, V. 36, No. 4, p. 28. (Abstract—see Hill, E.A.)

Lee, J.-K., Latex Sphere Retention by Microporous Membranes in Liquid Filtration, V. 36, No. 1, p. 26. *An experimental study of particulate matter retention by microporous membranes during liquid filtration was conducted using 0.1, 0.22, 0.45, and 0.65-μm-rated hydrophilic and hydrophobic membrance filters. Retention measurements were made with polystyrene latex spheres using an automated filter test system and a laser particle counter to measure the upstream and downstream particle concentration.* (CC: Filters and Filtration)

Lester, T., Investigation of Humidification Plant Additives as a Source of Contamination on Semiconductor Wafers, V. 36, No. 6, p. 15. (Abstract—see Berro, N.)

Liguore, S., Improvements in Avionics Durability Analyses, V. 36, No. 6, p. 26. (Abstract—see Followell, D.)

Lindow, E., Contamination Control of Polysilicon Gates in a Vertical Reactor Cluster Tool, V. 36, No. 3, p. 33. (Abstract—see Werkhoven, C.)

Liu, B.Y.H., Latex Sphere Retention by Microporous Membranes in Liquid Filtration, V. 36, No. 1, p. 26. (Abstract—see Lee, J.-K.)

Liu, B.Y.H., Particle Contamination Below a Robot Arm in a Cleanroom, V. 36, No. 5. p. 43. (Abstract—see Kuehn, T.)

Logsdon, P.B., Recovery and Recycle of HCFCs by Activated Carbon Adsorption, V. 36, No. 2, p. 33. *This paper describes how to use activated carbon to adsorb 1,1-dichloro-1-fluoroethane (HCFC-141b) from an airstream and later recover and recycle using steam desorption. The capacity of commercially available carbons to adsorb HCFC-141b and conditions to be used in the process are described.* (CC: Cleanroom Operation/Procedures; Modeling and Simulation)

M

Mattina, C.F., Summary of the Changes in the Recently Issued U.S. Federal Standard 209E (IES Technical Department Reports), V. 36, No. 2, p. 10. (CC: Cleanroom Operation/Procedures, Criteria and Standards)

McDonald, B., Scanning High-Efficiency Air Filters for Leaks Using Particle Counting Methods, V. 36, No. 5, p. 28. *This paper includes the equations that govern the scanning of high-efficiency filters with particle counters. The assumptions that bound the applicability of the equations are stated. The relationships provide the means to determine the appropriate linear scan rate and to understand the effect of the test parameters on the duration and accuracy of the test. The linear scan rate is derived in terms of a leak flow rate but a method is presented to relate the leak flow to the transitional leak penetration. Further, a method is described to standardize the definition of leak penetration to eliminate the dependence of measured leak penetration on the instrument used to measure it. The linear scan rate is shown to depend on the number of particle counts used to characterize the threshold leak. The statistical impact of the count used to calculate the linear scan rate is described.* (CC: Filters and Filtration; Identification, Measurement, and Monitoring; Modeling and Simulation)

Milholland, D., Use of a Three-Dimensional Ultrasonic Anemometer to Measure the Performance of Clean Zone and Delivery Systems, V. 36, No. 6, p. 32. (Abstract—see Hope, D.)

Miller, J., M., Process Inprovement Using In-Situ Particle Detection, V. 36, No. 3, p. 21. (Abstract—see Wu, J.J.)

N

Nagarajan, R., Size Distributions of Particles Extracted from Disk Drive Parts, V. 36, No. 1, p. 43. *Particle size distributions obtained by extracting particles from substrates cleaned by a variety of methods are plotted. These are compared against the MIL-STD-1246 distribution. Conclusions are drawn regarding the effects of the cleaning process and the measurement procedure on the applicability of the MIL-STD distribution for various substrates. The implications of these conclusions for the derivation of particulate cleanliness are pointed out.* (CC: Cleanroom Operation/Procedures; Criteria and Standards; Identification, Measurement, and Monitoring)

P

Paez, T.L., Nonlinear Aspects of Shock Response in Isolated Accelerometers, V. 36, No. 2, p. 41. *This paper dissusses the potential for the occurrence of chaos in a practical nonlinear system—the isolated accelerometer. A simple first-order model is proposed for the isolated accelerometer. It is shown that chaos can occur in the isolated accelerometer.* (DTE: Shock and Vibration)

Perez, R., Improvements in Avionics Durability Analyses, V. 36, No. 6, p. 26. (Abstract—see Followell, D.)

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Richards, D.P., A Round Robin Exercise on Road Transportation Data, V. 36, No. 4, p. 19. *This paper presents the results of a round robin exercise undertaken recently under the auspices of the Transportation Stresses Working Group of the Committee of European Environmental Engineering Societies (CEEES). Twenty-two agencies from six European countries participated in this work. Each participant undertook the analysis of an identical piece of measured data. The majority of the participants reported the data analysis, and many also derived test severities. This paper presents a basic comparison of the responses and assesses the results.* (DTE: Shock and Vibration)

Robinson, J.A., Proposed MIL-STD-810F (IES Technical Department Reports), V. 36, No. 2, p. 11. (DTE: Criteria and Standards)

Rogers, J.D., Testing in Combined Dynamic Environments, V. 36, No. 6, p. 19. *This paper describes the design and performance of a testing facility that combines vibration and centrifuge testing in a single operation. The facility utilizes Sandia National Laboratories' 29-ft undergrond centrifuge with an attached electrodynamic shaker. Also addressed are activities underway at SNL for development of a combined vibration and acoustic test facility. The combined dynamic environments of vibration and linear acceleration are experienced by a large number of spacecraft components and other devices.* (DTE: Acoustics, Shock and Vibration)

Rubow, K.L., Latex Sphere Retention by Microporous Membranes in Liquid Filtration, V. 36, No. 1, p. 26. (Abstract—see Lee, J.-K.)

S

Shepherd, F.R., Investigation of Humidification Plant Additives as a Source of Contamination on Semiconductor Wafers, V. 36, No. 6, p. 15. (Abstract—see Berro, N.)

Steimer, C.H., The TRW Thermal Insulation Process—Continuous Process Improvement in Work, V. 36, No. 3, p. 37. *This paper describes the Total Quality Management Continuous Process Improvement concept as applied to a specific cost-reduction project. The use of continuous process improvement (CPI) to successfully reduce formal documentation costs and organizational complexity in the*

development of spacrecraft multilayer insulation blankets is described. General CPI principles are also provided. (PR: Reliability Achievement)

Stuckey, W.K., Lessons Learned from the Long Duration Exposure Facility, V. 36, No. 5, p. 38. *The Long Duration Exposure Facility (LDEF) was launched by the space shuttle in April, 1984, and recovered in January, 1990. Fifty-seven experiments containing over 10,000 specimens tested the effects of the space environment on materials, components, and systems. Results from the LDEF investigators and the special investigation groups are summarized along with potential benefits for future missions.* (DTE: Solar and Space)

Surridge, R., Investigation of Humidification Plant Additives as a Source of Contamination on Semiconductor Wafers, V. 36, No. 6, p. 15. (Abstract—see Berro, N.)

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Werkhoven, C., Contamination Control of Polysilicon Gates in a Vertical Reactor Cluster Tool, V. 36, No. 3, p. 33. *This paper demonstrates that defect control is greatly improved when using the protected environment of a vertical reactor cluster tool comprising a preclean station. The cluster tool investigated combines the established process stability of vertical reactors with new capabilities as native oxide removal, ultraclean wafer transport, and reactors shielded from environmental contamination.* (CC: Cleanroom Operation/Procedures; Identification, Measurement, and Monitoring; Sources and Effects)

Westwood, W.D., Investigation of Humidification Plant Additives as a Source of Contamination on Semiconductor Wafers, V. 36, No. 6, p. 15. (Abstract—see Berro, N.)

Wu, J.J., Process Inprovement Using In-Situ Particle Detection, V. 36, No. 3, p. 21. *An engineering criterion is derived to determine when the particle level detected in exhaust flow can be treated as a representative measure of particle concentration in the reactor. It is established when gravitation sedimentation is the dominant phenomenon affecting particle deposition and when tbe particle distribution in the reactor is well-mixed. An example of using this technology to improve a plasma-enhanced vapor deposition process is presented.* (CC: Identification, Measurement, and Monitoring).

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Zhu, X., Three-Dimensional Computer Simulation of Gas Flow and Particle Transport in a Horizontal Diffusion Furnace, V. 36, No. 2, p. 25. (Abstract—see Busnaina, A.)

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